Estimation of rates of return of social protection : making the case for non-contributory social transfers in Cambodia

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Estimation of Rates of Return on Social Protection: Making the Case for Non-Contributory Social Transfers in Cambodia[1]

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ABSTRACT

This study estimates the rates of return (RoR) of non-contributory social transfer programmes in Cambodia using household data and going beyond standard cost efficiency analyses by developing a dynamic micro simulation. It shows that social protection promotes equitable economic growth by enhancing human development and fostering economic performance at the micro level. A positive RoR is achieved after 12 periods and can reach between 12 per cent and 15 per cent after 20 periods. This study shows that micro simulation models can be extended in order to analyse the economic returns on social protection.

Key Words: social protection, non-contributory social transfers, microsimulation, rate of return,
JEL classification: C15, H00, I38, O15

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INTRODUCTION

Social protection is being promoted in low and middle income countries as a mechanism to reduce poverty and inequality but also to promote human development. Several studies have estimated the potential benefits of social protection mechanisms and their financial affordability. However, no study so far has estimated the long-term economic return of such social protection investments. This paper intends to fill this gap.

Cambodia has achieved rapid economic growth and poverty reduction in recent years. However, most of its population is still living in vulnerable conditions due to malnutrition, lack of basic infrastructure, low quality of health care, low levels of human capital, vulnerable employment and the risk of natural disasters. In particular, low human capital and productivity and lack of infrastructure are impediments to future socio-economic development. In order to address these issues the Royal Government of Cambodia (RGC) has launched the National Social Protection Strategy for the Poor and Vulnerable (NSPS), which considers social protection as a mechanism to protect people against different kinds of risk and to bring the poor out of poverty.

The NSPS aims to contribute to the stability of the economy and to enhance human capital. The risks identified under the NSPS are: i) emergencies and crises related to external shocks and the vulnerability to natural disasters such as floods and droughts, ii) human development constraints in the form of malnutrition and food insecurity (especially during lean seasons), iii) seasonal unemployment and income insecurity caused by vulnerable employment (unpaid and self-employed workers), and (iv) health shocks that may trap people in vicious poverty cycles (RGC, 2011).

This study focuses on non-contributory social transfers and their role in socio-economic development. Social transfers reduce income poverty and inequality and thereby enhance social cohesion. They affect households' decisions to increase consumption and to invest in health, education, livelihoods and productive activities, which in turn raise labour productivity and result in higher disposable income, creating a virtuous circle. Furthermore social transfers may create new job opportunities by reducing cost barriers, such as related to transportation costs and easing the financial constraints, making it easier to move to another kind of work by affording longer search periods. The effect on economic growth occurs through higher productive capacity, increased labour productivity, higher consumption and investment and their spillover effects on local markets.

The study applies ex-ante microsimulation, using data from the Cambodia Socio-economic Survey (CSES) 2004 and 2009 collected by the National Institute of Statistics (NIS) of the Ministry of Planning (MoP). Diverse quantitative techniques are integrated to generate a comprehensive analysis of the potential benefits of social transfers in Cambodia. First, a cost-effectiveness analysis

is conducted on a basic package of social protection instruments (SPI) including cash transfers, scholarships, social pensions and public works. Second, econometric models are estimated to explain labour supply, school attendance and health status. Third, returns on human capital are calculated at the household level. Finally, a dynamic microsimulation is used to estimate human capital accumulation and total household consumption over time. The rate of return (RoR) is defined as the ratio of the net present value of benefits to the net present value of the costs.

The rest of the paper is organized as follows. Section one presents an analytical framework to identify the links between social protection, socio-economic development and economic growth. Section two introduces the socio-economic context in Cambodia and the choice of policy options. Section three presents the estimation of the model underlying the simulation, the results of which are discussed in section four. Section five concludes.

I. SOCIAL PROTECTION AND ECONOMIC GROWTH: AN ANALYTICAL FRAMEWORK

Social protection is the set of public and private interventions aimed at preventing, reducing and eliminating economic and social vulnerabilities to poverty and deprivation (UNICEF, 2012, p. 14). It covers a broad array of instruments including social insurance systems, labour market policies, and formal and informal social transfers.[2] It comprises all measures providing in-kind and cash benefits (transfers) in case of: i) non or insufficient work-related income due to sickness, disability, maternity, employment injury, unemployment, old age, or death of a family member; ii) lack of access to health care; iii) insufficient family support, especially for children and adult dependents; and, iv) poverty and social exclusion (ILO, 2010: 13). Social protection programmes help households maintain access to food, energy, education and health. They support families, individuals and communities helping them to prevent, mitigate and cope with adverse events.

Social protection mechanisms can be contributory and non-contributory. The first ones are insurance based, while the second group includes social transfers financed by the public budget. Contributory social security schemes provide guarantees and risk-pooling mechanisms that cannot be achieved by individualized systems. However, coverage levels and adequacy of benefits depend on different factors such as the degree of formalized employment and demographic trends. On the other hand, non-contributory social protection has proven to be an effective mechanism to alleviate poverty and to reduce coverage gaps by guaranteeing some level of protection (Cichon et al, 2011).

[2] There is no single definition of social protection. The International Labour Organization's definition further includes the provision of health care (ILO, 2010, p. 13), while, for example, the World Bank treats labour market policies separately from social protection (Grosh, del Ninno, Tesliuc, & Ouerghi, 2008, p. 5).

Figure 1 elaborates the analytical framework linking the effects of non-contributory social protection instruments to socio-economic development. Non-contributory social transfers directly affect household disposable income and, subject to the marginal propensity to consume, the level of consumption. This is the direct distributional effect, which depends on the design of benefits, their levels and targeted groups (e.g. Notten and Gassmann (2008)), and on administrative capacity. Barrientos (2005) estimated that social pensions reduced the poverty headcount ratio by 18.0 per cent in Brazil and 12.5 per cent in South Africa. Arnold et al. (2011) report evidence of a reduction in the poverty gap in Mexico of 20 per cent thanks to *Oportunidades* (a conditional cash transfer programme) and reductions in the income Gini coefficient of 3 percentage points in South Africa (following a cash grants system) and one percentage point in Brazil (thanks to social pensions and a conditional cash transfer programme called *Bolsa Familia*).

The changes in disposable income due to social transfers also affect households' behaviour. First, additional and/or secure income encourages households to invest in health. Several studies provide evidence about the positive effects of different social transfers on food consumption and health status of the population. The programmes reviewed differ in design, scope and coverage. However, the main determinants of a positive effect are the size and periodicity of the transfer, the target group and complementary investments. Permanent and higher benefits generate stronger effects due to income security. Targeting children at early age is more likely to have sustainable effects, and the existence of complementary programmes that guarantee access to quality food and health care increase the likelihood of a potential effect (Arnold, Conway, & Greenslade, 2011).

Furthermore child nutritional deprivation has a direct effect on education due to a lower ability to learn and reduces the opportunities to overcome poverty in the future (UNICEF, 2012). Cash transfers have been found to increase food consumption. The percentage of the transfer spent on food was estimated to be around 75 per cent in Malawi, and to increase by 165 per cent in Bolivia (Arnold, Conway, & Greenslade, 2011). In the case of Ecuador the share of food expenditure increased between 1.9 and 4.3 percentage points due to a conditional cash transfer programme called *Bono de Desarrollo Humano* (Schady & Rosero, 2008). Arnold et al. (2011) present evidence of increments in child immunization of 30 per cent in Peru (*Juntos*), reductions in starvation between 19 per cent and 48 per cent in Lesotho (social pensions) and decreases in maternal mortality of 11 per cent in Mexico (*Oportunidades*). In addition, *Oportunidades* increased health visits by 18 per cent (Barrientos & Scott, 2008), and gains in newborns weight were estimated at 0.58Kg in Colombia (*Familias en Acción*), as mentioned by UNICEF (2012).

The second behavioural income effect of social protection is the investment in education, which raises the level of human capital. International evidence is highly conclusive about a positive effect of social transfers on school attendance. This effect is similar for both conditional and unconditional

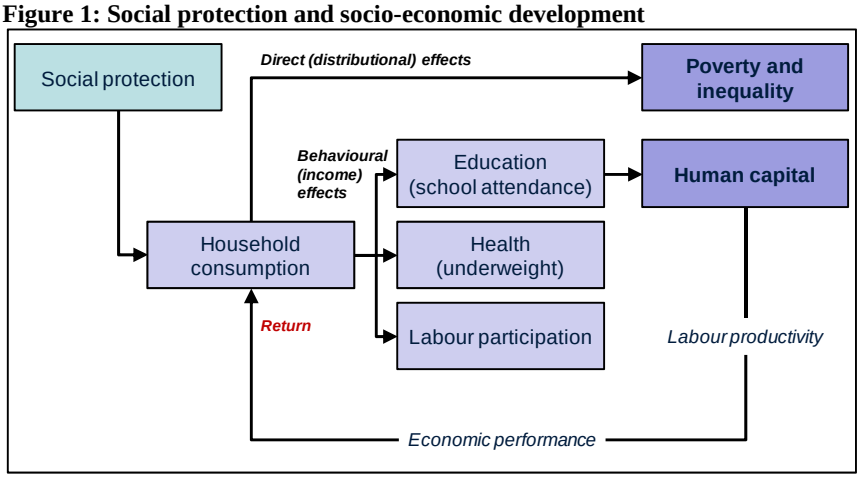
cash transfers; however, conditional cash transfers have a higher effect in the case of "marginal children" who were less likely to go to school (Akresh, De Walque, & Kazianga, 2013). Social transfers increase the disposable income and, by reducing costs barriers, increase school enrolment and attendance. But the size of the transfer has to be high enough to cover opportunity costs (e.g. income generated if the child is working) and other school related costs such as school supplies, transport or clothing. The effect on educational achievements is less clear as it depends on coverage and quality of the education system (e.g. Ponce and Bedi (2010)). Arnold et al. (2011) document increasing school enrolment of 11 per cent in Pakistan (Pujab programme), 5 per cent in Malawi (social cash transfer programme) and 30 per cent in Cambodia. Schady and Araujo (2006) report an increase in school enrolment of 10 per cent in Ecuador in response to the *Bono de Desarrollo Humano* conditional cash transfer.

Thirdly, changes in disposable income due to social transfers may affect labour supply as they generate the opportunity to take up work (e.g. covering transportation costs and reducing financial constraints) or to change jobs as the person may afford a longer search period. Regarding the argument that higher and secure income may reduce labour supply due to a substitution effect, it is likely that in the case of poor households the cost of leisure is still too high. International evidence suggests that indeed social transfers have a positive effect on labour supply, while reducing child work. Arnold et al. (2011) report that child work declined by 11 per cent in Cambodia and 26 per cent in Brazil due to social transfers, while Schady and Araujo (2006) estimate a reduction of child work by 17 per cent in Ecuador. Labour participation has been estimated to increase by 11 per cent in South Africa (social pensions) and by 2.6 percentage points in Brazil (*Bolsa Familia*) (Arnold, Conway, & Greenslade, 2011).

Increases in labour supply and human capital raise labour productivity, which leads to a higher income from work, creating a virtuous circle of economic development together with social development and poverty alleviation. We could enrich our model by adding households' investments in child wellbeing and productive activities that raise human and physical capital and foster labour productivity. Moreover, social transfers are likely to be spent locally, thereby generating local and regional economic multiplier effects. Enhancing local demand may create incentives for third party investments in the region (i.e. spillover effects). At this stage we have not included these generalizations of the model for lack of appropriate data. The potential benefits of social transfers can also be affected by conditions outside the strictly economics realm. While a positive effect on social cohesion, peace building and institutional change is expected as a result of lower inequality, both social and political will are necessary to sustain social protection investments. The implementation of formal social protection instruments (SPI) may crowd out

informal social protection mechanisms at the commune or family level.[3] Local characteristics (e.g. cultural/religious norms and values) may affect the behaviour of both beneficiaries and non-beneficiaries. The effects at the individual level will depend on how decisions are taken in the household pointing at the importance of the intra-household distribution. Potential behavioural effects induced by, for example, conditional social transfers have to be taken into account when designing social transfers. In the context of the current study, these relations are not included as they are beyond the scope of the modelling framework.

Figure 1: Social protection and socio-economic development



Finally, the cost of social protection has to be quantified in order to identify its net benefit. Financial affordability of social protection has been one of the main concerns during the last years. The introduction of a basic social protection package in low- and middle-income countries requires substantial funding. Basic social protection costs compared to GDP appear to be affordable even for low income countries. However, it does demand an important share of public expenditure. In low-income countries total public spending is generally in the range of 15-20 per cent of GDP (Arnold, Conway, & Greenslade, 2011, p. 71). Introducing, for example, a basic social pension for people 65 years and older would cost between 2 per cent and 8 per cent of current government expenditures (HelpAge, 2011, p. 4). These additional costs come on top of existing spending. Official development aid (ODA) may be necessary at first stages in low-income countries, but it is evident that social protection eventually has to be financed from national resources in order to be sustainable. Social protection investments are long-term and recurrent commitments.

Affordability depends on the available fiscal space, political will and policy priorities. The capacity to finance social protection investments requires different strategies to create fiscal space.

[3] Depending on the country context, this may be considered a positive result as it relieves the pressure on informal support networks.

Possible pathways include resource re-allocation, foreign aid, increasing tax/contribution rates and/or tax/contribution base, government borrowing and higher economic growth. Both the ability to diversify and increase tax income and economic activity determine the size and sustainability of government revenues. Economic growth may be the easiest way to create fiscal space. However, the affordability of social protection, in the end, remains an issue of political choice about the best way to allocate resources (Andrews, Das, Elder, Ovadiya, & Zampaglione, 2012, p. 26). As argued in this section, social protection has the potential to generate socio-economic outcomes and to foster economic growth, and as such it has to be considered as an investment in human development and economic performance.

II. COUNTRY CONTEXT AND POLICY SCENARIOS

Cambodia is a low income country with a per capita GDP, at current prices, of USD 830 in 2010 (NIS, 2011). The Cambodian Human Development Index is 0.523 in 2011 (lower medium human development), ranking 139 of 187 countries (UNDP, 2011). According to the General Population Census of 2008, the total population amounts to 13.4 million. 80 per cent of the population lives in rural areas, 51 per cent are women, children (0-14) represent 33.7 per cent of Cambodians, while the elderly (65+) represent 4.3 per cent of the total population (NIS, 2009).

The labour force (15+) accounts for around 7 million people in 2008. Among working persons, 34.5 per cent have not completed primary education. In 2008, 72.5 per cent of employment was generated in agriculture, forestry and fishery, followed by services and sales (19.3 per cent), and industry (8.6 per cent). 82.5 per cent of those who work are unpaid or self-employed (i.e. vulnerable employment). Labour productivity (value added per employee) increased from USD 631 in 1998 to USD 1,032 in 2008 (NIS, 2010). Poverty, measured by average household consumption per capita, declined from 62.0 per cent to 30.1 per cent between 2004 and 2009 (Table 1). However, the Gini coefficient of per capita consumption increased from 0.38 in 1993 to 0.40 in 2004 and to 0.43 in 2007 (NIS, 2010). Monthly household consumption per capita increased from USD 30 in 2004 to USD 68 in 2009. For 65 per cent of the households, the main source of income is self-employment. It provides 68 per cent of total income in rural areas and 60 per cent in urban regions. In 2009, the average monthly income per capita is USD 94. The relation between the richest (USD 119) and poorest (USD 5) quintile is 25.7 (NIS, 2010).

Net enrolment in primary education increased from 87 per cent in 2001 to 95 per cent in 2009, while the ratio for lower secondary enrolment has improved from 19 per cent to 32 per cent, but remains a challenge (NIS, 2010). The prevalence of underweight among under-five children has not

changed, after its decrease from 38 per cent in 2000 to 28 per cent in 2005 (CamNut, 2012). Finally, access to improved sanitation has increased from 56 per cent in 1998 to 82 per cent in 2008 in urban areas and from 6 per cent to 23 per cent in rural areas (RGC, 2009).

Table 1: Poverty and inequality in Cambodia

	Phnom Penh		Other Urban		Other Rural		Total	
	2004	2009	2004	2009	2004	2009	2004	2009
Consumption per capita per month (KHR)	217,418	497,211	122,668	318,877	77,547	184,510	226,739	226,739
	(130,833)	(332,281)	(90,933)	(220,315)	(46,348)	(110,081)	(75,406)	(184,182)
Consumption per capita per month (Phnom Penh equivalent) (KHR)	217,418	497,211	155,200	393,906	106,341	244,418	121,087	282,520
	(130,833)	(332,281)	(115,048)	(272,153)	(63,558)	(145,823)	(85,087)	(203,443)
Poverty								
Food poverty line per day* (KHR)	2,284	3,681	1,772	2,980	1,598	2,779		
Poverty line per day* (KHR)	3,749	5,716	2,963	4,627	2,734	4,315		
Food poverty head count (%)	5.2	1.1	16.3	2.4	25.5	8.2	22.7	7.0
	(0.222)	(0.105)	(0.369)	(0.152)	(0.436)	(0.275)	(0.419)	(0.255)
Poverty head count (%)	20.0	5.3	48.2	15.6	68.2	34.7	61.9	30.1
	(0.400)	(0.225)	(0.500)	(0.363)	(0.466)	(0.476)	(0.486)	(0.459)
Inequality								
Gini index of consumption*	0.312	0.318	0.360	0.343	0.287	0.284	0.327	0.327
	(0.003)	(0.004)	(0.003)	(0.003)	(0.001)	(0.001)	(0.001)	(0.001)

*based on information from NIS
Note: Standard errors are presented in brackets. Exchange rate is 4.050 and 4.140 KHR/USD in 2004 and 2009, respectively.
Source: Own calculations based on the CSES 2004 and 2009

In 2011, the RGC launched the National Social Protection Strategy for the Poor and Vulnerable (NSPS). Social protection is seen as a mechanism to protect people against different kinds of risk, and to bring the poor out of poverty. Given the focus on vulnerable people and the level of informality in Cambodia, the first stage for the implementation of the NSPS concentrates on non-contributory instruments, assumed to be financed mainly by external sources. For these reasons and due to data availability issues, the effects of taxation and user fees as well as contributory schemes are not analysed in this study. Furthermore, informal social transfers are not considered because our analysis concentrates on the implementation of formal social protection instruments.

A package of social protection instruments (SPI) is defined to simulate the implementation of the NSPS. It includes cash transfers, social pensions, scholarships and public works. These instruments have been selected given their priority in the NSPS, data availability, modelling feasibility and policy relevance. First, different scenarios are evaluated,

Table 2 presents a set of policy scenarios, which are based on current design proposals and costing studies for Cambodia (Hennicot, 2012). (1) Cash transfers are simulated under three scenarios for poor children up to 6 years old. Transfers are set at 60 per cent of the rural food poverty line payable on a monthly basis (equivalent of KHR 50,711 monthly per capita in 2009 or 12 USD). (2) Social pensions comprise two scenarios for persons 65 years and older with a monthly transfer set at 100 per cent of the rural food poverty line. Transfers are given to each member of the household 65 years and older, thereby guaranteeing a minimum living standard for the poor elderly population. This is fully in line with the objective of the Social Protection Floor. (3) Scholarships

are simulated for poor children in rural areas (including Phnom Penh) between 5 and 18 years old. Three scenarios are defined, one for each education level. Transfers are set at USD 50 per year (equivalent to 20 per cent of the rural food poverty line per year), based on the information provided by the Ministry of Education Youth and Sport (MoEYS). Transfers are understood as net amounts. The administrative costs of cash transfers, social pensions and scholarships are assumed to be 10 per cent of the transfer value. Due to the absence of relevant information, we assume perfect targeting, which is rather unlikely for real implementation, but it does not affect the comparison among simulated scenarios. (4) A public work programme (PWP) is simulated for poor households in rural areas (including Phnom Penh). The wage is set at USD 2.3 per working-day for a maximum of 80 days per person per year. It is assumed that only one person per household is included, and that around 10 per cent of eligible households participate. Participation is randomly assigned. Non-wage costs are set at 50 per cent of total cost, following Hennicot (2012). The model does not include the effects of infrastructure creation and livelihood generation as part of PWP, as this is beyond the scope of the current modelling framework. Therefore, only income effects at the household level are taken into account. Finally, we simulate a joint policy package, which includes scenarios 3, 5, 7 and 9. 73 per cent of beneficiary households receive only one transfer (out of four SPI), 23 per cent receive two and 3 per cent receive three benefits. This combined scenario provides social protection over the individual life-cycle, covering early childhood and old age vulnerability, working-age seasonal unemployment, as well as promoting school attendance.

Individual scenarios are compared based on their effectiveness to reduce poverty (P) and inequality (G) (i.e. direct-distributional effect). Cash transfers are estimated to cost between 1.0 per cent and 1.1 per cent of GDP. The costs for social pensions (scenarios 4 and 5) are considerably lower (0.4 per cent of GDP). The total costs of the scholarship programmes are between 0.01 per cent and 0.4 per cent of GDP. Finally, the total costs of the public work program are estimated at 0.2 per cent of GDP (scenario 9). The costs of these SPI may decrease over time in case of continuous poverty reduction. The costs of social pension may, however, increase over time as population ages. The costs of scholarships may also increase following demographic patterns and new incentives to attend school. The combined package of cash transfers, social pensions and PWP is estimated to cost between 1.5 per cent and 1.7 per cent of GDP (between 7.5 per cent and 8.3 per cent of public expenditures) given 2009 conditions. It is equivalent to between KHR 658 billion and KHR 731 billion (around USD 159 million and USD 176 million) per year. Adding scholarships for poor children at any education level increases the total costs to a maximum of KHR 925 billion (around USD 223 million) per year, equivalent to 2.2 per cent of GDP (10.5 per cent of public expenditure and 18.9 per cent of current spending) given 2009 conditions. The total cost for the

combined package (scenario 10) amounts to KHR 686 billion (around USD 166 million) or the equivalent of 1.6 per cent of GDP per year. Transfers represent 88 per cent of total cost.

The last four columns of Table 2 present the reductions in poverty and inequality per 1 per cent of GDP invested for each policy scenario. It is important to note that the purpose of this analysis is to compare different policy scenarios and not policy objectives. Social pensions to poor individuals over 64 years old (Scenarios 4 and 5) are the most cost-effective SPI to reduce the poverty headcount in Cambodia (around 15 per cent per GDP percentage point invested), followed by cash transfers (Scenarios 1 to 3) to poor children (between 11.9 per cent and 12.1 per cent per GDP percentage point invested).[4] Cash transfers to poor children are more cost-effective in reducing the poverty gap (between 11.3 per cent and 11.6 per cent per GDP percentage point invested) and severity (over 19 per cent per GDP percentage point).[5] This means that transfers focused on poor children reach the poorest among the poor in the country. Among scholarships (Scenarios 6 to 8) those for primary education are the most cost-effective to reduce poverty severity, lower secondary scholarship for poverty headcount and upper secondary for the poverty gap.[6] In terms of inequality decline, all the modelled SPI and policy scenarios have a cost-effectiveness ratio between 2.3 and 3.3. It means that an investment of 1 per cent of GDP in any of the modelled SPI may reduce inequality (measured by the Gini coefficient for consumption per capita) by between 2.3 per cent and 3.4 per cent. In scenario 10, poverty is reduced by 12.6 per cent, 9.0 per cent and 15.2 per cent for the headcount, gap and severity measures, respectively, while inequality declines by 3.1 per cent. The total benefits are higher than those generated by any individual SPI, but the cost-effectiveness ratios are at the average level.

[4] Poverty headcount measures the proportion (percentage) of the population living below the poverty line.
[5] Poverty gap measures the extent to which poor individuals fall, on average, below the poverty line.
[6] Poverty severity is a weighted poverty gap, where poorest individuals received a higher weight. In this sense it captures distributional issues among the poor. A reduction in poverty severity means that the poorest gain relatively more than the less poor.

Table 2: Social protection instruments and policy options

Social Protection Instrument		Target Population	Benefit	Transfer		Total Cost		Cost effectiveness ratios (%) – CSES 2009			
				KHR billion	% of GDP	KHR billion	% of GDP	Poverty (head count)	Poverty (gap)	Poverty (severity)	Inequality (Gini)
Cash transfer	Scenario 1	Poor children 0-6 years old	KHR 50,711 (USD 12) per month (60 per cent rural food poverty line)	448	1.0	493	1.1	11.9	11.4	19.3	3.2
	Scenario 2	Poor children 0-6 years old in rural areas		417	1.0	458	1.1	11.8	11.6	19.7	3.3
	Scenario 3	Poor children 0-6 years old in rural areas, up to 2 per household		391	0.9	430	1.0	12.1	11.3	19.4	3.3
Social pension	Scenario 4	Poor persons 65+ years old	KHR 84,519 (USD 20) per month (100 per cent rural food poverty line)	148	0.3	163	0.4	14.7	4.6	7.5	2.9
	Scenario 5	Poor persons 65+ in rural areas		139	0.3	153	0.4	14.8	4.3	7.4	2.9
Scholarship	Scenario 6	Poor children at primary education in rural areas	KHR 202,845 (USD 50) per year (20 per cent rural food poverty line)	149	0.4	164	0.4	11.2	12.8	21.4	3.3
	Scenario 7	Poor children at lower secondary in rural areas		25	0.1	28	0.1	15.5	7.7	11.4	3.1
	Scenario 8	Poor children at upper secondary in rural areas		2	0.0	3	0.0	5.4	18.7	14.8	3.0
Public works	Scenario 9	Poor persons 18-64 years old in rural areas, up to 1 per household (80 days per year)	KHR 9,522 (USD 2.3) per day	50	0.1	75	0.2	11.2	5.2	9.3	2.3
Joint scenario	Scenario 10	Scenarios 3, 5, 7 and 9	Scenarios 3, 5, 7 and 9	605	1.4	686	1.6	12.6	9.0	15.2	3.1

Note: Cost effectiveness ratios measure poverty/inequality reductions over total programme costs equivalent to one percentage of GDP, in %.
Source: Own calculations based on the CSES 2009.

III. ESTIMATION OF THE MODEL

The model is based on the analytical framework presented in section I (Figure 1). Income from social transfers directly increases consumption. In the absence of any reference material for Cambodia, the marginal propensity to consume out of social transfers is assumed to be equal to one. This most probably overestimates the direct effects on consumption, but it does not affect the comparison among simulated scenarios. The objective of the model is not to generate socio-economic predictions, but to estimate potential rates of returns of investments in social protection in Cambodia.

First we estimate the responsiveness of school attendance, nutrition and labour supply to changes in income generated by the allocation of social transfers (the behavioural income effects) and of consumption to changes in human capital, proxied by the length of schooling. These parameters will then be used in the micro simulations reported in the next section to compute the rates of return of social protection instruments. The latter are computed by comparing the net benefits and respective costs of a baseline policy without any SPI and the SPI joint policy scenarios.

We take the data from the 2004 and 2009 waves of the Cambodia Socio-economic Survey (CSES) that is collected by the National Institute of Statistics (NIS) of the Ministry of Planning (MoP). CSES 2004 (2009) includes 59,832 (57,105) individuals in 11,988 (11, 971) households, representing a population of 13.0 (14.0) million people. Estimations are based on the pooled data from the two waves so that the estimates represent average effects.[7] Consumption is estimated for households because data on consumption are only available at this level. It is not possible to analyse intra-household distribution. School attendance and labour participation, however, are estimated at the individual level. Wages are available at the individual level only for those working in the formal sector.

3.1. Behavioural effects

Behavioural effects are limited, in this study, to the response of changes in disposable income on education (school attendance), health (underweight) and labour decision. Individual and household characteristics, as well as regional and time dummies are used as control variables.[8] Since the CSES does not contain sufficient information about income, household consumption is used as a proxy.

[7] We have preferred estimating on pooled data in order to increase the number of observations.

[8] For additional information regarding the data underlying our estimations, see Mideros, A., F. Gassmann and P. Mohnen. 2012, *Estimation of Rates of Return of Social Protection Instruments in Cambodia: A Case for Non-Contributory Social Transfers*, Maastricht Graduate School of Governance, Research Report.

School attendance

School attendance is identified in the CSES for all individuals aged 5 and older. This dichotomous variable takes value one if a child attends school and zero otherwise. School attendance is not linearly related with age. Attendance is high when a child reaches school age (6 years old) up to a point where the opportunity cost (e.g. foregone work income) compensates the potential benefit of increasing human capital, after which the probability of going to school decreases. This is consistent with a decreasing incidence of school attendance.[9] Household economic conditions affect school attendance as they determine the capacity to cover education costs and the constraints in household resource allocation. Attendance rates beyond the age of 10 decrease more rapidly for children from poor households.[10] School attendance also depends on previous school achievements. In the case of lower secondary (grades 7 to 9) and upper secondary education (grades 10 to 12) the probability that a student continues studying increases as he or she moves to higher grades.[11] This observation is consistent with the idea that the benefits of education are related to the achievement of certain levels rather than displaying a continuous return. However, school attendance rates decrease at higher grades of primary education.[12]

School attendance is estimated using an IV probit model, where household consumption, considered as endogenous, is instrumented by the exogenous variables of the model in addition to the availability of toilet facility, electricity and roof quality (Table 3). The regression includes all individuals between 6 and 25 years old. The total number of observations is 43,562 when pooling the CSES 2004 and 2009 data. In addition, separate estimations are conducted for poor households by education level (primary, lower secondary and tertiary education). School attendance is specified as a function of age, household income (approximated by consumption) and the difference between age and schooling (i.e. age minus completed years of education). The last variable captures the effect of past behaviour.

Household consumption is positively related to school attendance (Table 3). At the national level a 10 per cent increase in the level of household consumption leads to a 0.2 percentage point higher probability of attending school. This effect is substantially higher for rural areas and poor households. A 10 per cent increase in household consumption per capita (i.e. USD 3.4 per month

[9] School attendance decreases from 99 per cent at age 6 to 94 per cent at age 12, 71 per cent at age 15 and 47 per cent at age 17. Girls have lower attendance rates than boys at any age (own calculations based on CSES 2009).
[10] School attendance at age 17 is 71.4 per cent for children in the richest quintile, and 34.1 per cent for those in the poorest quintile (own calculations based on CSES 2009).
[11] The grade is defined as the total number of previous years of schooling plus one for eligible persons between 6 and 18 years old. For instance, a person who has completed 4 years of education should attend grade 5. Primary education corresponds to grades 1 to 6, lower secondary education to grades 7 to 9, and upper secondary education to grades 10 to 12.
[12] School attendance decreases from 99 per cent to 76 per cent between grades 1 and 7, and then it increases to 81 per cent at grade 9 and to 96 per cent at grade 12 (own calculations based on CSES 2009).

for a median poor rural household) is related to a 2 percentage point higher probability of attending school and a 2.7 percentage points higher probability in poor rural household. If we estimate school attendance for poor rural individuals separately by level of education, we obtain that the marginal effect of a 10 per cent increase in the level of household consumption is related to a 5.6 percentage points higher probability of attending lower secondary education, a 2.2 percentage points higher probability of attending primary education and a non-precisely (insignificantly) estimated 3.7 higher probability of attending upper secondary education.

Results show that social transfers by increasing household disposable income are likely to affect education investments, and subsequently to generate positive effects on human development. In the case of poor rural households, social transfers may have a higher effect to increase attendance at lower secondary education. However, there is no significant effect for upper secondary education, which may be explained by low expected returns in the future (this can also explain a non-significant effect on urban poor individuals). In this sense, complementary policies to increase the quality of education and to enhance future labour opportunities are necessary to create incentives for school attendance, promote human development and to increase the returns of social protection investments[13].

[13] The non-significant coefficients for non-poor urban children in upper-secondary education could also be due to the lower number of observations for that group (less than 500).

Table 3: Average marginal effects on the probability of attending school[14]

	National		National (Poor)		Rural (Poor)	
ln(hh_consumption)	0.024	***	0.205	***	0.267	***
	(0.006)		(0.071)		(0.097)	
Female=1	-0.041	***	-0.042	***	-0.042	***
	(0.003)		(0.004)		(0.005)	
Year=2009	-0.072	***	-0.173	***	-0.201	***
	(0.005)		(0.038)		(0.052)	
N	43,562		20,079		17,839	
Pseudo R2	0.610		0.603		0.602	
Log Pseudo likelihood	-11,263		-5,286		-4,703	
Under specification test (Kleinberg-Paap)						
P-value	0.000		0.000		0.000	
Weak identification test (Kleinberg-Paap)						
F-statistic	296.73		36.94		24.54	
Overidentification test (Sargan J statistic)						
P-value	0.675		0.085		0.014	
	Primary Education		**Lower Secondary**		**Upper Secondary**	
	Rural Poor					
ln(hh_consumption)	0.226	**	0.560	**	0.373	
	(0.089)		(0.262)		(0.516)	
N	13,316		3,693		820	
Pseudo R2	0.672		0.402		0.303	
	Rural Non-Poor					
ln(hh_consumption)	0.035		0.174	***	0.027	
	(0.036)		(0.066)		(0.115)	
N	9,642		5,229		2,236	
Pseudo R2	0.754		0.520		0.393	
	Urban Poor					
ln(hh_consumption)	0.003		0.393		0.365	
	(0.118)		(0.276)		(0.625)	
N	1,559		512		164	
Pseudo R2	0.686		0.554		0.364	
	Urban Non-Poor					
ln(hh_consumption)	0.018		0.138	**	0.123	
	(0.036)		(0.070)		(0.135)	
N	2,796		2,011		1,569	
Pseudo R2	0.742		0.621		0.506	

Note: Heteroskedasticity consistent standard errors (between brackets) are estimated using bootstrapping, clustering at the household level and the delta method. All specifications include as explanatory variables (even if not reported) age, age^2 and age^3, the number of persons in the household by five age groups, asset dummies (dwelling, bicycle, motorcycle and car), the age of the head of the household and the maximum level of education in the household, income (proxied by household consumption) and the difference between age and schooling. Specifications at the national level also control for region. The estimates are for the probit model, while the reported tests are for the linear probability models. Excluded instruments are dummy variables for toilet facility, electricity and roof quality.

The tests for the quality of the instruments are conducted for the linear probability models and reported underneath the marginal effects. A rejection of the null hypothesis for the underidentification test indicates that the instrument matrix is of full rank, which is the case for all specifications. In other words, the instruments are sufficient to identify the parameters. For the weak specification test the F-statistic is compared with the Stock and Yogo critical values of the F-statistic. The estimated F-statistics are higher than the 5 per cent critical value for IV relative bias in all cases, except for rural poor individuals in upper secondary model. However, alternative specifications (using two instead of three excluded instruments) provide valid results while the coefficient of interest does not change significantly. Finally, the null hypothesis for the overidentification test is that the additional instruments are uncorrelated with the error term. The null hypothesis cannot be rejected at the 10 per cent level on the estimated specifications, with the exception of the model for rural poor persons in lower secondary education. Changing the selection of instruments (reducing it to one) yields a non-rejection of the overidentifying restrictions without changing significantly the coefficient of interest.

*** Significance at 1 per cent, ** significance at 5 per cent, * significance at 10 per cent

Source: Own calculations based on the CSES 2004 and 2009

[14] The complete models can be obtained from the authors upon request.

Nutrition

Nutrition is one of the main human capital problems in Cambodia. It is at the same time a cause and an effect of poverty. Improving nutrition has a direct effect on reducing mortality and improving economic returns. Nutrition is also related to cognitive and productive capacity. Early years are decisive for people's well-being during their entire life. Chronically malnourished children lag behind in their physical development. Cognitive development can also be seriously affected, leading to long-term problems during school years and later on in life (e.g. Ravallion (2009); Ortiz et al (2011); Bloem et al (2010)). Under-nutrition among young children can be the result of different factors, including the health status of the mother, feeding practices, and access to health care and sanitation Household economic conditions are also determinants of access to food and a nutritious diet (e.g. UNICEF (2000); Barrientos and DeJong (2006)).

In 2009, the incidence of underweight among under-five children was 29.9 per cent at the national level. In rural areas the incidence increased to 31 per cent, while in urban areas it was between 21.6 per cent (Phnom Penh) and 22.5 per cent (other urban regions). Malnutrition is higher for children from the 20 per cent poorest households (34.6 per cent).[15] Poor children are highly exposed to malnutrition, which in the end reduces their future opportunities to escape poverty.

Underweight is defined as a dichotomous variable and is estimated using a probit model. Household consumption per capita can be considered as exogenous in the case of underweight. Due to data limitations many factors related to child malnourishment cannot be included in the model. Control variables are introduced to deal with observable characteristics and unobservable ones are assumed to be equally distributed. In this sense, the model does not predict underweight but identifies the relation between household economic conditions and the probability of being malnourished. The regression includes all children under 5 years old including random effects at the village level. The estimation is done pooling the CSES 2004 and 2009 data. The total number of observations is 7,329.

At the national level, on average, a 10 per cent increase in household consumption per capita is related to a 0.4 percentage points lower probability of being underweighted (Table 4). The relation between household consumption and incidence of underweight is not significant for poor households. These findings show that other (non-income) factors are more relevant to explain the causes of current malnutrition of poor children in Cambodia, and that complementary policies are needed to achieve this kind of objective. Having a proper toilet facility (as a proxy for sanitation conditions) is associated with a 6 per cent to 8 per cent lower probability of being underweight in poor households. A higher household education level (estimated by the maximum level in the

[15] Own calculations based on the CSES 2004 and 2009, following the WHO methodology.

household) is also related with a lower probability of being malnourished. It is significant at the household level for the national average, while mother's education is significant in the case of poor children but not in rural areas. Mother's age is negatively correlated with children being underweight.

Table 4: Average marginal effects on the probability of an underweight child less than 5 years of age[16]

	National		National (Poor)		Urban (Poor)		Rural (Poor)	
ln(hh_consumption)	-0.043	***	-0.048		-0.080		-0.038	
	(0.015)		(0.038)		(0.127)		(0.041)	
Age (months)	0.005	***	0.005	***	0.004	***	0.005	***
	(0.000)		(0.000)		(0.002)		(0.001)	
Mother complete primary education=1	-0.012		-0.028		-0.024		-0.029	
	(0.015)		(0.026)		(0.064)		(0.028)	
Mother complete lower secondary=1	-0.036		-0.126	***	-0.299		-0.092	
	(0.025)		(0.047)		(0.612)		(0.059)	
Mother complete upper secondary=1	-0.019		0.118		0.184		0.071	
	(0.040)		(0.137)		(1.003)		(0.177)	
Mother's age	-0.002	*	-0.003	*	-0.003		-0.003	*
	(0.001)		(0.002)		(0.006)		(0.002)	
Female=1	-0.029	**	-0.015		-0.068		-0.008	
	(0.011)		(0.018)		(0.054)		(0.020)	
Year 2009=1	-0.043	***	-0.077	**	-0.104		-0.077	**
	(0.017)		(0.030)		(0.107)		(0.033)	
Schooling (max)	-0.004	*	-0.003		-0.009		-0.001	
	(0.002)		(0.005)		(0.013)		(0.005)	
Other Urban=1	-0.002		-0.044					
	(0.028)		(0.055)					
Other Rural=1	0.038		0.012					
	(0.026)		(0.050)					
No toilet=1	0.026		0.062	**	-0.062		0.081	***
	(0.016)		(0.030)		(0.072)		(0.029)	
N	7,329		3,268		376		2,892	
Log Pseudo Likelihood	-4,320		-2,051		-217		-1,822	
Groups	1,375		947		166		781	
Sigma^2 (village)	0.135		0.173		0.074		0.176	

Note: Heteroskedasticity-consistent standard errors (between brackets) are estimated using bootstrapping, clustering at the household level and the delta method. Random effects are included at the village level. All specifications control for the number of persons in the household by five age groups, dummy variables for assets (dwelling, bicycle, motorcycle and car), dummies for single-headed household and roof quality, distance to water source and number of persons per room.

*** Significance at 1 per cent, ** significance at 5 per cent, * significance at 10 per cent

Source: Own calculations based on the CSES 2004 and 2009

Labour

We estimate first the discrete choice of not working, performing paid work or performing unpaid work and, secondly, the number of hours a person works per week. Table 5 presents labour participation rates by age group, region and poverty condition. The proportion of unpaid work is higher in rural areas and for poor children, while the proportion of non-work is higher in urban areas for all working age groups (between 18 and 64 years old).

Receiving a transfer may reduce labour supply because it guarantees a minimum disposable income under any working situation. A person may have the same income working less. However,

[16] The complete models can be obtained from the authors upon request.

this effect is likely to differ by age and socio-economic conditions. It may also depend on the transfer amount and its relative size compared to labour income. At the household level work is a matter of resource allocation, where each member may be affected differently (e.g. a reduction in child labour may be compensated by higher labour supply of adults). Finally, a higher and more secure income may create incentives for productive investments and reduce credit constraints, thereby increasing labour participation.

Table 5: Labour participation by age group and poverty condition (2009, %)

Age group	National			Poor		
	No work	Unpaid work	Paid work	No work	Unpaid work	Paid work
Between 5 and 14	68.6	27.1	4.3	61.6	32.0	6.4
Between 15 and 17	34.4	44.6	21.0	24.9	48.9	26.2
Between 18 and 30	15.9	28.0	56.1	10.6	31.3	58.1
Between 31 and 45	7.3	7.0	85.7	6.6	7.9	85.5
Between 46 and 64	14.5	5.0	80.5	13.1	5.2	81.7
Over 64	44.4	4.3	51.3	46.3	3.1	50.6
Total	29.6	22.1	48.2	28.6	26.8	44.6
Age group	**Urban**			**Rural**		
	No work	**Unpaid work**	**Paid work**	**No work**	**Unpaid work**	**Paid work**
Between 5 and 14	90.2	7.9	2.0	64.2	31.0	4.8
Between 15 and 17	60.0	25.3	14.8	28.6	49.0	22.4
Between 18 and 30	29.0	17.9	53.1	12.0	31.1	57.0
Between 31 and 45	13.2	5.6	81.2	5.4	7.5	87.1
Between 46 and 64	24.3	4.0	71.7	11.1	5.3	83.6
Over 64	58.7	4.2	37.0	39.4	4.3	56.3
Total	40.3	11.6	48.1	26.7	25.0	48.3

Source: Own calculations based on CSES 2009

Labour participation is estimated using a multinomial probit model to estimate the probability of working, differentiating between paid and unpaid work. Household consumption per capita is endogenous and the model follows two steps to deal with this potential endogeneity bias, as in the school attendance regression. Labour participation is estimated for all individuals between 5 and 80 years old. When pooling the CSES 2004 and 2009 data, the total number of observations is 74,329, of which 28,593 represent poor people.

The marginal effects of income (proxied by household consumption per capita) on the choice of work for poor people are presented in Table 6. A 10 per cent increase in household consumption reduces the probability of unpaid work by 15 percentage points for poor children between 5 and 14 years old both in rural and urban areas. For poor individuals between 15 and 17 years old, it decreases the incidence of unpaid work by 40 percentage points in urban areas and only by 14 percentage points in rural areas. For poor individuals between 18 and 30 years old, it reduces the incidence of unpaid work by 16 percentage points in urban areas and by only 12 percentage points in rural areas. In the case of poor people older than 30 the probability of doing unpaid work decreases by 1 to 5 percentage points, somewhat more in urban areas than in rural areas, however the effects are not statistically different from zero.

An increase in household consumption reduces paid work for the youngest and the oldest age categories in urban as well rural areas and increases it for some persons in between. For instance, a 10 per cent increase in household consumption increases the incidence of paid work by 19 percentage points for urban poor between 15 and 17 years old and by 10 percentage points for rural poor between 18 and 30 years old. However, only the last two (positive) results are statistically significant different from zero.

The results show that higher income does not discourage paid labour participation in Cambodia. Moreover it may promote paid labour participation for poor people between 18 and 45 years old in rural areas and between 15 and 30 years old for people in urban areas. The probability of performing unpaid work, however, decreases as income goes up for all age and geographic groups. These results are consistent with the idea that increasing permanent household consumption may help to afford transportation costs and overcome financial constraints to generate productive activities especially in rural areas, while child labour is reduced.[17]

Table 6: Average marginal effects of log of household consumption per capita on the probability of choosing to work for pay, to do unpaid work, or not to work. [18]

	(5-14)		(15-17)		(18-30)		(31-45)		(46-64)	
Unpaid work										
Urban (Poor)	-1.512	*	-4.076	***	-1.605	*	-0.499		-0.369	
	(0.815)		(1.004)		(0.832)		(0.544)		(0.806)	
Rural (Poor)	-1.520	***	-1.442	**	-1.236	***	-0.547		-0.119	
	(0.440)		(0.568)		(0.395)		(0.344)		(0.349)	
Paid work										
Urban (Poor)	-0.352		1.940	***	0.936		-0.921		-0.025	
	(0.338)		(0.745)		(0.803)		(0.674)		(0.916)	
Rural (Poor)	-0.042		-0.256		1.004	**	0.374		-0.605	
	(0.192)		(0.448)		(0.395)		(0.388)		(0.452)	
No work										
Urban (Poor)	1.864	**	2.136	**	0.669		1.420	***	0.394	
	(0.819)		(1.016)		(0.520)		(0.526)		(0.694)	
Rural (Poor)	1.562	***	1.698	***	0.232		0.173		0.723	*
	(0.436)		(0.472)		(0.259)		(0.267)		(0.389)	
N										
Urban (Poor)	786		381		1,011		639		369	
Rural (Poor)	6,997		3,091		7,474		4,896		2,519	

Note: Heteroskedasticity-consistent standard errors (in brackets) are estimated clustered at the household level, and the delta method. All specifications include age and age square, gender dummy, time effects, schooling, age of household head, household maximum schooling, number of persons in the household by five age groups, dummy variables for assets (dwelling, bicycle, motorcycle and car), roof quality and dummy variables for productive livelihoods (plot, livestock, business and credit) as control variables .

*** Significance at 1 per cent, ** significance at 5 per cent, * significance at 10 per cent

Source: Own calculations based on the CSES 2004 and 2009

We can estimate a labour supply equation at the individual level, explaining the number of hours worked per person but only for people with paid work, using a Heckman selection model

[17] For additional estimations regarding labour decisions, see Mideros, A., F. Gassmann and P. Mohnen. 2012, *Estimation of Rates of Return of Social Protection Instruments in Cambodia: A Case for Non-Contributory Social Transfers*, Maastricht Graduate School of Governance, Research Report.

[18] The complete models can be obtained from the authors upon request.

(Table 7). Unlike in table 6, we here focus only on paid labour supply and we examine the elasticities of the number of hours worked. Higher household consumption is related with an increase in the number of hours worked by poor urban residents, although the estimates are not significant, and a decrease in the number of hours worked by poor rural residents. For instance, a 10 per cent increase in their household consumption reduces the number of hours worked by 9 per cent for the 18-30 years old and by 7 per cent the 31-45 years old. It may well be that as income increases poor rural households choose to participate in paid work leaving unpaid activities, but that the actual number of hours worked actually decreases.

Table 7: Marginal effects of household consumption on the logarithm of hours worked conditional on choosing to work for pay, sample selection model, by age groups. [19]

Age groups	(15-17)	(18-30)		(31-45)		(46-64)	(18-64)	
Urban (Poor)								
ln(hh-consumption)	1.035	0.305		0.397		0.002	0.188	
	(1.719)	(0.496)		(0.448)		(0.708)	(0.325)	
N	381	1,011		639		369	2,019	
Log Pseudo Likelihood	-185	-833		-630		-300	-1,830	
Wald test of independence of the selection Equation from main equation: p-value	0.870	0.000		0.980		1.000	0.000	
Overidentification test (Sargan J statistic): p-value for main equation	0.596	0.008		0.663		0.059	0.011	
p-value for the selection equation	0.085	0.347		0.300		0.237	0.119	
Rural (Poor)								
ln(hh-consumption)	-0.757	-0.918	**	-0.744	*	0.357	-0.585	*
	(0.889)	(0.452)		(0.415)		(0.697)	(0.305)	
N	3,091	7,474		4,896		2,519	14,889	
Log Pseudo Likelihood	-1,850	-6,930		-5,050		-2,890	-15,200	
Wald test of independence of the selection Equation from main equation: p-value	0.096	0.000		0.000		0.000	0.000	
Overidentification test (Sargan J statistic): p-value for main equation	0.000	0.218		0.797		0.583	0.531	
p-value for the selection equation	0.092	0.027		0.480		0.761	0.038	

Note: Heteroskedasticity-consistent standard errors, clustered at the household level, are reported in brackets. All specifications include age and age square, gender dummy, time effects, schooling, age of the household head, the household maximum schooling, the number of persons by (five) age groups, dummy variables for assets (dwelling, bicycle, motorcycle and car) and a dummy variable for public provided electricity. The model at the national level also includes dummy variables for three regions (Phnom Penh, other urban and other rural. Dummy variables for productive livelihoods (plot, livestock, business and credit) are included in the selection equation. Excluded instruments for the endogeneity of household consumption are dummy variables for toilet facility and roof quality. The Wald test of independence between the main equation and the selection equation shows that in most cases there is a need to correct for selectivity. The null hypothesis of overidentification cannot be rejected at the 1 per cent level except for two cases.
*** Significance at 1 per cent, ** significance at 5 per cent, * significance at 10 per cent
Source: Own calculations based on the CSES 2004 and 2009

3.2. Economic returns to schooling

Returns to schooling are estimated, following a Mincer wage equation, for those individuals working in the formal sector (i.e. who receive a monthly wage). The logarithm of reported wages is used as the dependent variable. The model includes individuals between 15 and 64 years old. The

[19] The complete models can be obtained from the authors upon request.

total number of observations is 46,435 when pooling CSES 2004 and 2009, of which 13,490 have formal work[20].

A Heckman selection model is estimated because we observe wages only for workers in the formal sector. Correcting for sample selection, as we should given the low p-value of the correlation coefficient between the errors in the selection and in the main equations, we conclude that, on average, an additional year of schooling is related to a 4.1 per cent higher wage for those persons working in the formal sector. The return is 6.3 per cent in urban areas compared to 3.3 per cent in rural areas. Wages are 12 percentage points lower for women in urban areas, whereas gender differences are not significant in rural areas (Table 8).

Table 8: Heckman selection model. Dependent variable: log wages. [21]

	National		Men		Women		Urban		Rural	
	Heckman Selection Model									
Schooling	0.041	*	0.045	*	0.039	*	0.063	*	0.033	*
	(0.003)		(0.004)		(0.005)		(0.005)		(0.004)	
Female=1	-0.043	**					-0.120	*	-0.014	
	(0.018)						(0.027)		(0.022)	
N	46,435		25,069		21,366		10,286		36,149	
Wald test of independent equations (Rho = 0) P-value	0.000		0.000		0.000		0.041		0.000	

Note: Heteroskedasticity-consistent standard errors, clustered at the village level, are reported in brackets. All specifications include experience and experience square, time effects, dummies for three regions (Phnom Penh, other urban and other rural), schooling, fixed effects at the province level. Dummies for 13 economic sectors are controlled for only in the selection equation.
*** Significance at 1 per cent, ** significance at 5 per cent, * significance at 10 per cent
Source: Own calculations based on the CSES 2004 and 2009

Returns to schooling are low in Cambodia, in comparison with international evidence, a fact that produces low incentives to invest in education. The difference may be explained in two ways. First, the quality of education is likely to be low in low-income countries. Second, returns on human capital are expected to be low in the context of generally low economic productivity conditions.

Because of the high level of informal work in Cambodia the estimation of returns to schooling applies to only a limited fraction of the population. As an alternative we can estimate the returns to schooling at the household level by taking household consumption as a proxy for income. We can consider the "allocative effect" of human capital (i.e. the ability to allocate resources) to be captured by the maximum level of education in the household, as opposed to the "productivity effect" (i.e. the capacity to produce) that would be measured by the median level of education (Jolliffe, 2002).

Table 9 examines the "allocation effect"[22]. The maximum level of education is endogenous, and two-stage least squares (2SLS) is used to correct for a possible endogeneity bias. The first stage

[20] Formal workers represented 26 per cent of workers in 2004 and 31 per cent in 2009 (own calculations based on CSES 2004 and 2009).
[21] The complete models can be obtained from the authors upon request.
[22] Additional estimations included the median schooling of the working age members of the household. The coefficient was significant at 1 per cent, however very small (between 0.0065 and 0.0073). Besides, the effect is completely

estimates the household's maximum level of education as a function of the education level of the household's head.[23] Results are used in the next section to estimate the economic return of SPI through human capital accumulation at the household level. The return of an additional year of education on household consumption is between 1.6 per cent (urban) and 1.8 per cent (rural) for poor households and between 2.6 per cent (rural) and 4.2 per cent (urban) for non-poor households. The effect on poor households is similar in urban and rural areas, while for non-poor households the return is lower in rural areas. These results are likely to reflect the participation in economic sectors with lower levels of productivity in the case of poor and rural households (e.g. lower returns are related with agriculture and informal activities).

Table 9: 2SLS estimation of logarithm of household consumption per capita, by region and poverty condition.[24]

	Urban (Non-poor)		Urban (Poor)		Rural (Non-poor)		Rural (Poor)	
Schooling (max)	0.042	***	0.016	**	0.026	***	0.018	***
	(0.005)		(0.007)		(0.003)		(0.002)	
(Year 2009)=1	0.535	***	0.481	***	0.504	***	0.527	***
	(0.023)		(0.020)		(0.012)		(0.009)	
_cons	3.961	***	3.115	***	4.034	***	3.107	***
	(0.053)		(0.052)		(0.049)		(0.057)	
N	3,626		869		9,363		7,331	
Adjusted R2	0.582		0.552		0.484		0.571	
Weak identification test (Kleinberg-Paap)								
F-statistic	434.47		131.44		1,292.99		1,146.14	

Note: Heteroskedasticity-consistent standard errors, clustered at the primary sample unit, are reported in brackets. All specifications include the number of persons by (five) age groups, economic activity (crop production, livestock and own-business), assets (dwelling, bicycle, motorcycle and car) and dummy variables for toilet facility, electricity and quality of roof. The reported weak identification test statistic refers to the subsample of households where the head is not the person with highest level of education in the household (i.e. where the correlation between the instrumental variable and the endogenous regressor is not equal to one). For this subsample, the coefficients for schooling are 0.0409, 0.0137, 0.0325 and 0.0307 (significant at 1 per cent), respectively by column. .
*** Significance at 1 per cent, ** significance at 5 per cent, * significance at 10 per cent
Source: Own calculations based on CSES 2004 and 2009

In order to calculate an economic rate of return of social protection investments, a microsimulation model is developed in the next section. The estimates of the effects of household consumption on school attendance (Table 3) and the returns on education (Table 9) will be used in the next section to simulate the benefits of the direct increase in household consumption due to social transfer payments and the indirect increase due to the additional years of schooling stimulated by the social transfers over a certain number of periods. We have not included the other two direct effects of social transfers that we have estimated – the probability of malnutrition (underweight) and the labour force participation – because, on the one hand, we lack data to estimate the effect of

captured by the maximum level of education when the variable is not included, while the adjusted R2 does not change significantly.

[23] In 2009, the education level of the household head was lower than the maximum education level of the household in 61 per cent of the cases at the national level. It means that another member of the household had a higher education than the household head (own calculations based on CSES 2009).

[24] The complete models can be obtained from the authors upon request.

underweight on educational achievements and, on the other hand, we only have data on wages earned for workers in the formal sector. We leave the incorporation of these elements in the rate of return calculation of social protection for future work.

IV. DYNAMIC MICROSIMULATION AND RATE OF RETURN ON SOCIAL PROTECTION

In order to identify the potential benefits of policy scenarios over time, we apply dynamic micro simulation. The technique allows the analysis of economic and social policies at the micro level (i.e. individuals, households and firms) with a focus on distributional issues rather than on average or aggregate levels (Merz, 1994)[25]. The main difference between static and dynamic micro simulation is that the latter allows individuals to change from period to period due to endogenous factors.

Benefits are estimated as the difference between the base line policy scenario without any social transfers and the joint SPI policy scenario, which includes: i) cash transfers for poor children up to 6 years old in rural areas, limited up to two children per household (as in Scenario 3), ii) social pensions for poor persons over 64 years old (as in Scenario 5), iii) scholarships for poor children in rural areas attending lower secondary education (as in Scenario 7), and iv) public works programme (PWP) covering 10 per cent of poor households in rural areas (as in Scenario 9).

The dynamic model includes three modules: demography, human capital accumulation and household consumption based on the effects estimated in the previous section. Other variables and changes in economic and structural conditions, such as economic growth or inflation, are assumed to have the same effects on the base line and policy scenarios, and therefore cancel out. The simulation is done for 20 periods $t = \{1,...,20\}$. Transfers are allocated to beneficiary households based on targeting criteria (age of individuals, poverty condition and region). Households are moreover differentiated by the number of members, age, gender, region (Phnom Penh, other urban and other rural), household consumption and poverty condition using the CSES 2009. The total number of years of schooling is determined for each individual by gender and age at each period. Finally, we use the coefficients identified by gender and age to simulate school attendance. The model estimates for every period the need for SPI, the level of schooling, household consumption and poverty and inequality. Comparative outcomes between the base line and policy scenario are presented.

[25] For surveys on dynamic micro simulation models and techniques, see O'Donoghue (2001) and Li and O'Donoghue, (2012).

4.1. Demography

Population ageing is based on survival rates calculated from official population projections by age, sex and region (urban and rural) available from the National Institute of Statistics (NIS). Age is increased by one year a period. New births are probabilistically assigned to each household, differentiating between gender (boys and girls). The probabilities are estimated using a probit model based on household characteristics, and restricted to be positive only for households with at least one woman at childbearing age (i.e. 15 to 44 years old) (Table 10). Subsequently, the estimated total population is compared with official projections (by age, gender and region) and weights are adjusted by post stratification, differentiating between urban and rural regions, to align with official projections (i.e. NIS (2011)). Periods correspond to years, using the CSES 2009 as starting point.

Table 10: Average marginal effect on the probability of a new birth.[26]

Variable	Male I		Male II		Male III		Female I		Female II		female III	
Number of women (15-44)	0.011	***	0.013	***	0.013	***	0.006	***	0.007	**	0.007	**
	(0.003)		(0.003)		(0.003)		(0.002)		(0.003)		(0.003)	
ln(Consumption)	-0.040	***	-0.051	***	-0.055	***	-0.025	***	-0.033	***	-0.035	***
	(0.005)		(0.005)		(0.006)		(0.005)		(0.005)		(0.005)	
Head of house (age)	-0.002	***	-0.002	***	-0.002	***	-0.002	***	-0.002	***	-0.002	***
	(0.000)		(0.000)		(0.000)		(0.000)		(0.000)		(0.000)	
Schooling (max)	0.002	*	0.001		0.001		0.001		0.000		0.000	
	(0.001)		(0.001)		(0.001)		(0.001)		(0.001)		(0.001)	
Number of persons (1-4)			-0.013	***	-0.014	***			-0.012	***	-0.013	***
			(0.004)		(0.004)				(0.004)		(0.004)	
Number of persons (5-14)			-0.014	***	-0.014	***			-0.012	***	-0.013	***
			(0.002)		(0.002)				(0.002)		(0.002)	
Number of persons (15-17)			-0.034	***	-0.034	***			-0.034	***	-0.034	***
			(0.005)		(0.005)				(0.005)		(0.005)	
Number of persons (18-64)			0.008	***	0.007	***			0.010	***	0.009	***
			(0.002)		(0.002)				(0.002)		(0.002)	
Number of persons (65+)			0.013	**	0.012	**			0.006		0.005	
			(0.006)		(0.005)				(0.005)		(0.005)	
Rural=1	-0.010		-0.009		-0.007		-0.004		-0.003		-0.006	
	(0.006)		(0.006)		(0.007)		(0.006)		(0.006)		(0.007)	
Province fixed effect	NO		NO		YES		NO		NO		YES	
N	11,345		11,345		11,345		11,345		11,345		11,345	
Pseudo R2	0.054		0.085		0.094		0.035		0.067		0.074	
Log Pseudo Likelihood	-574,000		-555,000		-550,000		-536,000		-518,000		-514,000	

Note: Heteroskedasticity-consistent standard errors are estimated, clustered at the household level.
*** Significance at 1 per cent, ** significance at 5 per cent, * significance at 10 per cent
Source: Own calculations based on the CSES 2009

The difference between the estimated demographic development and official projections for the population is lower than 0.3 per cent for any period. The total population in Cambodia is projected to grow at an average rate of 1.3 per cent per period, increasing from 14 million people in period 1 to 18 million in period 20 (Table 11). The relation between rural and total population decreases from 0.8 to 0.7 over the 20 periods, while the total dependency ratio (population under 15 years old plus individuals 65 years old and older over persons between 15 and 64 years old) decreases from 0.58 to 0.56.

[26] The complete models can be obtained from the authors upon request.

Table 11: Population by period, region, gender and age (thousands)

	Period 1	Period 5	Period 10	Period 15	Period 20
Population	**14,085**	**14,942**	**16,034**	**17,084**	**18,003**
Urban	2,815	3,268	3,905	4,545	5,148
Rural	11,270	11,673	12,129	12,539	12,856
Households	**2,945**	**3,077**	**3,188**	**3,301**	**3,370**
Urban	574	640	690	738	778
Rural	2,371	2,437	2,498	2,563	2,592

Source: Own calculations using a dynamic microsimulation model.

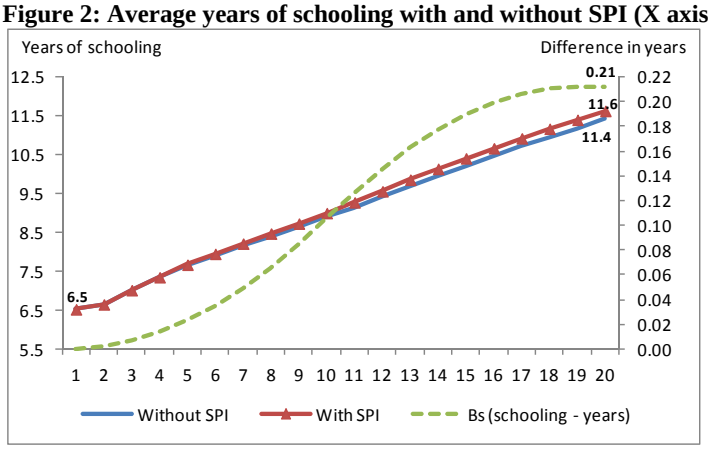
4.2. Human capital accumulation

Human capital accumulation is limited to education. School attendance is simulated using the estimated parameters. Benefits (Bs) are defined as the difference between the change in average years of schooling between period 1 and period T (T=1,…20) for the population between 18 and 64 years old (i.e. working age) in the policy ($S^{l,1}$) and the base line ($S^{l,0}$) scenario following:

$$B_{S^l,t=T} = \left(S^{l,1}_{t=T} - S^{l}_{t=1}\right) - \left(S^{l,0}_{t=T} - S^{l}_{t=1}\right) = \left(S^{l,1}_{t=T} - S^{l,0}_{t=T}\right). \quad \textbf{(1)}$$

The total average education level is slightly higher if social protection investments are introduced. For example, in periods 5 and 20 the average years of schooling is 0.02 and 0.21 years higher (0.3 per cent and 1.9 per cent, respectively) under a simulation with SPI than without it (Figure 2).

Figure 2: Average years of schooling with and without SPI (X axis = period), people between 18 and 64 years old



Source: Own calculations using a dynamic microsimulation model.

After 10 periods the positive difference exceeds 1 per cent. Hence, the duration of social protection investments matters for the achievement of benefits in terms of human capital accumulation. But increasing the quality of education and its economic returns will create additional incentives to further invest in education.

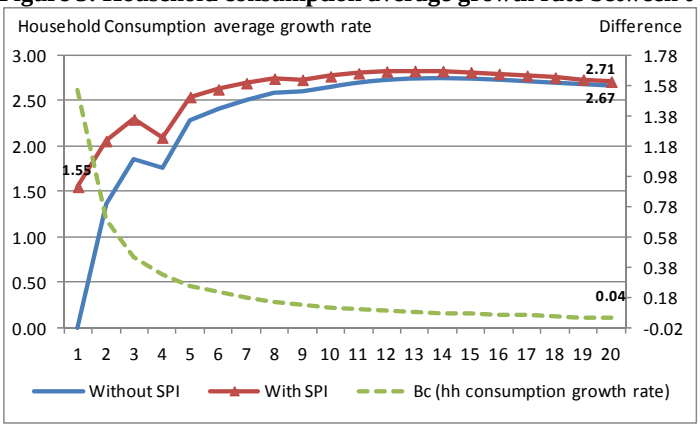
4.3. Household consumption

Household consumption is initially determined using the CSES 2009, and then adjusted based on the policy scenario. From the second period onwards, changes in household consumption are simulated through the return on human capital accumulation (previously calculated). Annual growth rates in total household consumption ($g_C = \left(C_{t=T}/C_{t=1}\right)^{1/T} - 1$, where C is household consumption, T=1,…,20) are calculated for the base line and the SPI policy scenario. The difference between the two outcomes represents the benefit in economic performance at the micro level (B_C).

$$B_{C,t=T} = \left[\left(\frac{C^1_{t=T}}{C_{t=1}}\right)^{1/T} - 1\right] - \left[\left(\frac{C^0_{t=T}}{C_{t=1}}\right)^{1/T} - 1\right] = \frac{\left(C^1_{t=T}\right)^{1/T} - \left(C^0_{t=T}\right)^{1/T}}{\left(C_{t=1}\right)^{1/T}} \quad \textbf{(2)}$$

Total household consumption grows by an additional 0.04 percentage points if SPI scenario 10 is implemented over the 20 years' period. The change in the level of total household consumption in period 1 is solely due to the social transfers, while the increase in subsequent periods is also due to higher human capital (approximated by the years of schooling). Household consumption grows faster if SPI are implemented (Figure 3) indicating the potential positive economic impact of SPI in Cambodia. The difference does decrease over time as the need for social protection is going down due to the expected decline in poverty.

Figure 3: Household consumption average growth rate between t=1 and t=T, % (X axis = period T)



Source: Own calculations using a dynamic microsimulation model.

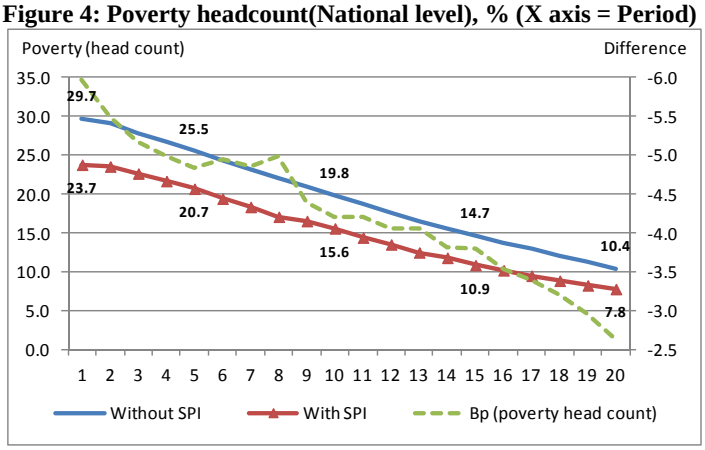
Finally, the dynamic effects on poverty and inequality (B^d_P, B^d_G) are estimated based on the changes in household consumption. The benefit is the difference of the changes in poverty and inequality between the base line and policy scenarios over time (from $t=1$ to $t=T$, T=1,…,20).

$$B^{d}_{P,t=T} = \left(P^{0}_{t=1} - P^{1}_{t=T}\right) - \left(P^{0}_{t=1} - P^{0}_{t=T}\right) = \left(P^{0}_{t=T} - P^{1}_{t=T}\right) \quad \textbf{(3)}$$

$$B^{d}_{G,t=T} = \left(G^{0}_{t=1} - G^{1}_{t=T}\right) - \left(G^{0}_{t=1} - G^{0}_{t=T}\right) = \left(G^{0}_{t=T} - G^{1}_{t=T}\right). \quad \textbf{(4)}$$

Poverty and inequality decrease faster in response to SPI. The poverty headcount is 4.8 (2.6) percentage points lower if SPI are implemented after 5 (20) periods (Figure 4); while the Gini coefficient for consumption is 0.014 (0.010) points lower with SPI in the same period. The size of these benefits decreases over time because less people receive the transfers each period as it is targeted to the poor. It is important to note that the model does not generate predictions about future poverty levels, because poverty lines may change over time. Results show that social protection investments do generate both social and economic benefits in Cambodia.

Figure 4: Poverty headcount(National level), % (X axis = Period)



Source: Own calculations using a dynamic microsimulation model.

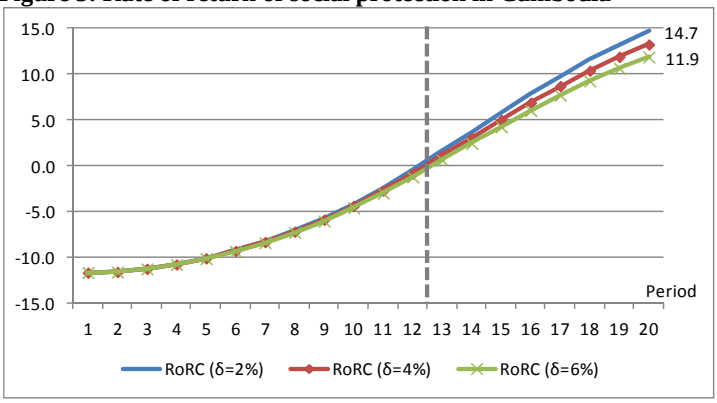
4.4. Rate of return

The rate of return (RoR) on social protection is measured as the ratio of total benefits and total costs, at present value, associated with the social protection policy. Total benefits are measured in terms of household consumption using the estimated parameters based on micro data that were reported in section 4 and the total simulated costs of SPI scenario 10. The numerator in Equation 5 is the present value of the difference in household consumption under the policy (C^{1}_{t}) and baseline (C^{0}_{t}) scenarios from period 1 to period T. The denominator is the present value of the cost of SPI (I_t) between period 1 and period T. δ is the discount rate used in the present value calculations. In this analysis three values are used ($\delta = \{2\%, 3\%, 4\%\}$).The RoR is calculated for any period between T=1 and T=20, and represents the net benefit (in terms of household consumption) as the percentage of the SPI's cost in period T:

$$RoR_{C,T} = \left[\frac{\sum_{t=1}^{T} \left(C_t^1 - C_t^0 \right) (1+\delta)^{-t}}{\sum_{t=1}^{T} I_t (1+\delta)^{-t}} - 1 \right] \times 100 . \quad \textbf{(5)}$$

The RoR becomes positive in period 12 (Figure 5) when the net benefit (difference in total household consumption between policy and baseline scenario) exceeds the cost of the investment (including administrative costs). After 15 periods, the social protection investment generates a positive economic return of around 5 per cent and between 12 per cent and 15 per cent after 20 periods. The RoR increases with time from -11.6 per cent in period 1 to -10.1 per cent in period 5, and to between 11.9 per cent and 14.7 per cent in period 20 (Table 12). This return is related to the benefit of a 0.04 percentage point higher average annual growth rate of household consumption. While the RoR is defined as the excess of net benefits over net costs at present value for a given discount rate, we can alternatively define the internal rate of return (IRR), which is the discount rate that equates the present value of net benefits and the present value of net costs related to a given social protection scenario. Estimations show that the IRR has a value of 16 per cent in period 20 (see the bottom of Table 12).

Figure 5: Rate of return of social protection in Cambodia



Source: Own calculations using a dynamic microsimulation model.

The final effect through higher household consumption should be complemented by higher productive capacity. In the case of Cambodia it is likely to happen because a GDP growth rate around 7 per cent is expected and different policies are being implemented to reach this objective.

Finally, it is important to note that the rate of return that we have calculated is very likely to be underestimated due to the exclusion of institutional changes, health improvements (e.g. nutrition), inter-industry spillovers, local multiplier effects, and labour supply responses. Moreover, the model does not include the productivity improving effects of new infrastructure and improved livelihoods. Similarly, complementary policies in the area of sanitation, health care and quality of education will only strengthen the positive effect and raise the RoR. However, the specific design of social

protection interventions, their implementation, administrative issues and financing aspects also affect the potential benefits and returns of social protection investments. Finally, financial sustainability and the effect of taxation and budget reallocation need to be included in a more comprehensive analysis.

Table 12: Benefits, cost and rate of return (RoR) of social protection in Cambodia

Benefits	Scenario	Period 1	Period 5	Period 10	Period 15	Period 20
Average years of education (18-64 years old)	With social protection	6.52	7.67	9.00	10.40	11.62
	Without social protection	6.52	7.65	8.89	10.22	11.41
	Benefit (difference)	0.00	0.02	0.11	0.19	0.21
Total household consumption average annual growth rate (%)	With social protection	1.55	2.54	2.77	2.82	2.71
	Without social protection	0.00	2.29	2.65	2.74	2.67
	Benefit (difference)	1.55	0.26	0.12	0.07	0.04
Poverty headcount (%)	With social protection	23.74	20.7	15.6	10.9	7.8
	Without social protection	29.71	26.7	19.8	14.7	10.4
	Benefit (difference)	-6.0	-6.0	-4.2	-3.8	-2.6
Inequality (Gini coefficient of consumption)	With social protection	0.313	0.314	0.314	0.308	0.302
	Without social protection	0.329	0.328	0.327	0.320	0.312
	Benefit (difference)	-0.016	-0.014	-0.013	-0.012	-0.010
Costs	**Policy**	**Period 1**	**Period 5**	**Period 10**	**Period 15**	**Period 20**
Cost (% of GDP)	Social protection package	1.6	1.4	1.2	0.9	0.8
RoR	**Discount rate**	**Period 1**	**Period 5**	**Period 10**	**Period 15**	**Period 20**
Rate of Return (Absolute benefit on total household consumption / absolute cost) (%)	2%	-11.6	-10.0	-4.1	5.8	14.7
	3%	-11.6	-10.1	-4.3	5.0	13.3
	4%	-11.6	-10.1	-4.6	4.3	11.9
Internal rate of return		**Period 1**	**Period 5**	**Period 10**	**Period 15**	**Period 20**
IRR (%)					10.9	16.1

Source: Own calculations using a dynamic microsimulation model.

V. CONCLUDING REMARKS

This study uses a dynamic microsimulation model to estimate the economic rate of return on non-contributory social transfers in the mid- and long term. The data used are from the Cambodian Socio-economic Survey (CSES), and the selected policy options are in line with the National Social Protection Strategy. To calculate a rate of return on social protection different economic effects need to be estimated. In the absence of other evidence, we assume that one dollar of income from social transfers increases household consumption by one dollar. This marginal increase in household consumption will lead to higher school attendance, lower malnutrition and increased labour supply.

Our estimates based on micro data reveal the following. First, a 10 per cent increase in household consumption raises the probability of attending school by 0.2 percentage points. This effect is significantly higher for rural (2.0 percentage points) and especially poor rural persons (2.7 percentage points). For the latter, the effect is found to be higher for lower secondary education (5.6 percentage points) than for primary education (2.2. percentage points), and not significant for tertiary education. Second, a 10 per cent increase in household consumption is related with a 0.4

percentage point lower probability of children being underweighted. However, this effect is not significant for poor children. Third, the effect of social transfers through higher disposable income on labour decisions is studied using three different regression models. In the case of labour participation it is found that social transfers may discourage unpaid work for poor individuals, but promote paid work for poor individuals in rural areas. Similar results are found for labour supply in terms of the number of hours worked. The effect is positive for individuals from households with consumption below USD 100 per person per month (80 per cent of the population), and it is insignificant for the richest 20 per cent of the population. Further, social transfers promote formal labour by increasing household disposable income. We also estimate the indirect effect of social protection on years of schooling. On average, an additional year of schooling is related with a 4.1 per cent higher wage in Cambodia (6.3 per cent in urban areas, and 3.3 per cent in rural regions). Because most Cambodians work in the informal sector, we also estimate the relationship between years of schooling and income (approximated by consumption) at the household level. We find that, on average, an additional year of schooling is related with 4.4 per cent higher household consumption. This effect is 4.2 per cent (1.6 per cent) for (poor) urban dwellers and 2.6 per cent (1.8 per cent) for (poor) rural inhabitants.

Based on these estimates, a dynamic microsimulation is conducted in order to assess the benefits from social protection. A policy scenario that combines four social protection instruments (cash transfers, social pensions, scholarships and public works) is used for the simulations. Specific design characteristics of the individual policies can therefore not be captured. The results indicate that the average years of education for individuals between 18 and 64 years old (i.e. of working age) are higher if SPI are implemented. After 20 periods the difference is 0.21 years (1.8 per cent higher) and it increases over time. However, the benefit is not generated immediately. This supports the idea that social transfers should be regular and reliable in order to achieve positive effects. SPI require long-term investments in order to guarantee that resources are invested in education. In the case of total household consumption, the average annual growth rate is 0.04 percentage points higher after 20 periods if the SPI policy is implemented. It means that social protection investments have the potential to increase the economic growth rate, as long as the economy can react to higher effective demand, which is likely to happen if resources are not being fully utilized and/or under expectations of high economic growth as in the case of Cambodia. In addition, both poverty rate and Gini coefficient are lower if SPI are implemented. These results show that non-contributory social protection may generate positive effects on socio-economic development but also on economic performance. Finally, the rate of return on social protection (RoR) is calculated by dividing the difference in household consumption under the joint social protection policy scenario and the baseline scenario without SPI by the cost of the policy, all properly discounted. It needs 13

periods to obtain a positive RoR. In period 20 the RoR is between 11.9 per cent and 14.7 per cent using different rates of discount. After 20 periods the cost of the investment is more than fully recovered, including administrative costs.

It is important to note that due to data limitations all SPI are simulated as cash transfers and the returns are assumed to be the same for all SPI. Behavioural (income) effects may differ depending on the specific design characteristics of the SPI. In addition, the model does not include financing issues neither is it able to compare with potential alternative investments. In this sense, the final results may be overestimated. On the other hand, behavioural (non-income) effects - health improvements (e.g. nutrition), spillovers, regional multipliers, and institutional effects - are not taken into account, which most probably results in an underestimation of the returns. Moreover, if SPI are implemented as part of a multi-sector strategy returns can be fostered as sanitation conditions, quality and coverage of infrastructure and public services (e.g., health and education) are developed and economic productivity is increased. Even more, social protection by solving human capital constraints helps to generate the conditions for future economic development.

The study shows that investments in social protection in Cambodia may generate both social and economic benefits, even recovering the cost of the investment in the long term. The cost of the proposed policy reaches 1.6 per cent of GDP in period 1 and then decreases to 0.8 per cent of GDP in period 20. This amount of resources seems affordable for a low income country as Cambodia, and the political will has been established in the NSPS. However, it is necessary to guarantee resources for social protection investments over time, as most of the benefits occur in the long term. In addition, it is important to note that social protection also contributes to greater social cohesion and helps to build peace.

SPI should be designed so as to promote positive behavioural (non-income) effects. Finally, permanent monitoring and evaluation during the implementation of the NSPS is vital to guarantee that the expected effects (e.g. school attendance, best feed and health care practices, livelihoods generations) are being achieved. Furthermore, collection of economic information over time at the local level (i.e. commune) and the design of a social accounting matrix are recommended for future research on the economic impact of the NSPS.

This study shows that micro simulation models can complement traditional cost-effectiveness and cost-benefit analyses by providing mid- and long-term economic returns on social protection policies. However, it is advisable to extend the model, if data are available, to study aspects not covered in this study as for example: i) financing aspects through taxation, contributory schemes and a comparison with alternative public investments; ii) behavioural (non-income) effects; iii) health sector; iv) links to macro analysis using a social accounting matrix; and v) regional multipliers by collecting economic data at the commune level.

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